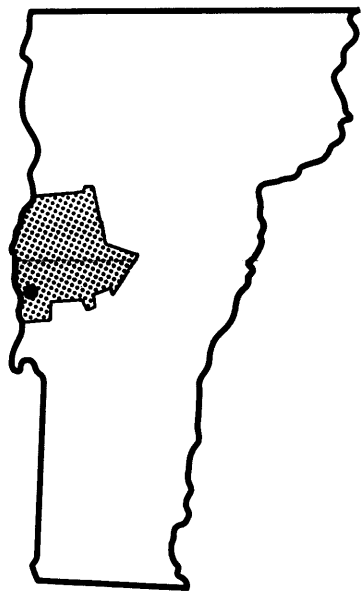
FLOOD INSURANCE STUDY

TOWN OF SHOREHAM, VERMONT

ADDISON COUNTY



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U.S. DEPARTMENT of HOUSING & URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION

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TOWN OF SHOREHAM,
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1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the Town of Shoreham, Addison County, Vermont, and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to convert the Town of Shoreham to the regular program of flood insurance by the Federal Insurance Administration. Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain management.

1.2 Coordination

An initial meeting was held on April 19, 1976 between local officials, representatives of the Federal Insurance Administration, and the Study Contractor in order to determine the areas to be studied in detail and those to be studied using approximate methods. An announcement of intent to perform a Flood Insurance Study appeared in the Addison County Independent on July 22, 1976. The Vermont Department of Water Resources, the New York State Department of Environmental Conservation, and the Addison County Regional Planning Commission were notified of the study and a request was made for any pertinent information. The U.S. Department of Interior, Fish and Wildlife Service was contacted to obtain available topographic mapping of the detailed study area. The community was requested to submit data concerning flood hazards, flooding experience, plans to avoid potential flood hazards, and any other data deemed appropriate. Periodic contacts were made with local community officials to keep them informed of the progress of the study and to solicit pertinent information. The New York State Department of Transportation, Waterways Maintenance Group was contacted and their 60 years of lake level observations at Whitehall, New York, were obtained. The U.S. Geological Survey (USGS) forwarded their records for annual peak lake levels at Whitehall, South Bay, and the Fort Ticonderoga Railroad Station starting in April 1969. Dufresne-Henry Engineering Corporation was also in attendance at a meeting on Lake Champlain Study Methods conducted by representatives of the Federal Insurance Administration held in Montpelier, Vermont.

A final meeting attended by representatives of the Federal Insurance Administration, the community, and the Study Contractor was held on September 19, 1978 to resolve any problems or conflicts with the results of this study and to provide an opportunity for local community officials to become familiar with the planning material being provided. The study was accepted by those attending the meeting.

1.3 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were performed by Dufresne-Henry Engineering Corporation for the Federal Insurance Administration, under Contract No. H-4020. This work, which was completed in February 1978, covered all significant flooding sources affecting the Town of Shoreham.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Shoreham. The area of study is shown on the Vicinity Map (Figure 1).

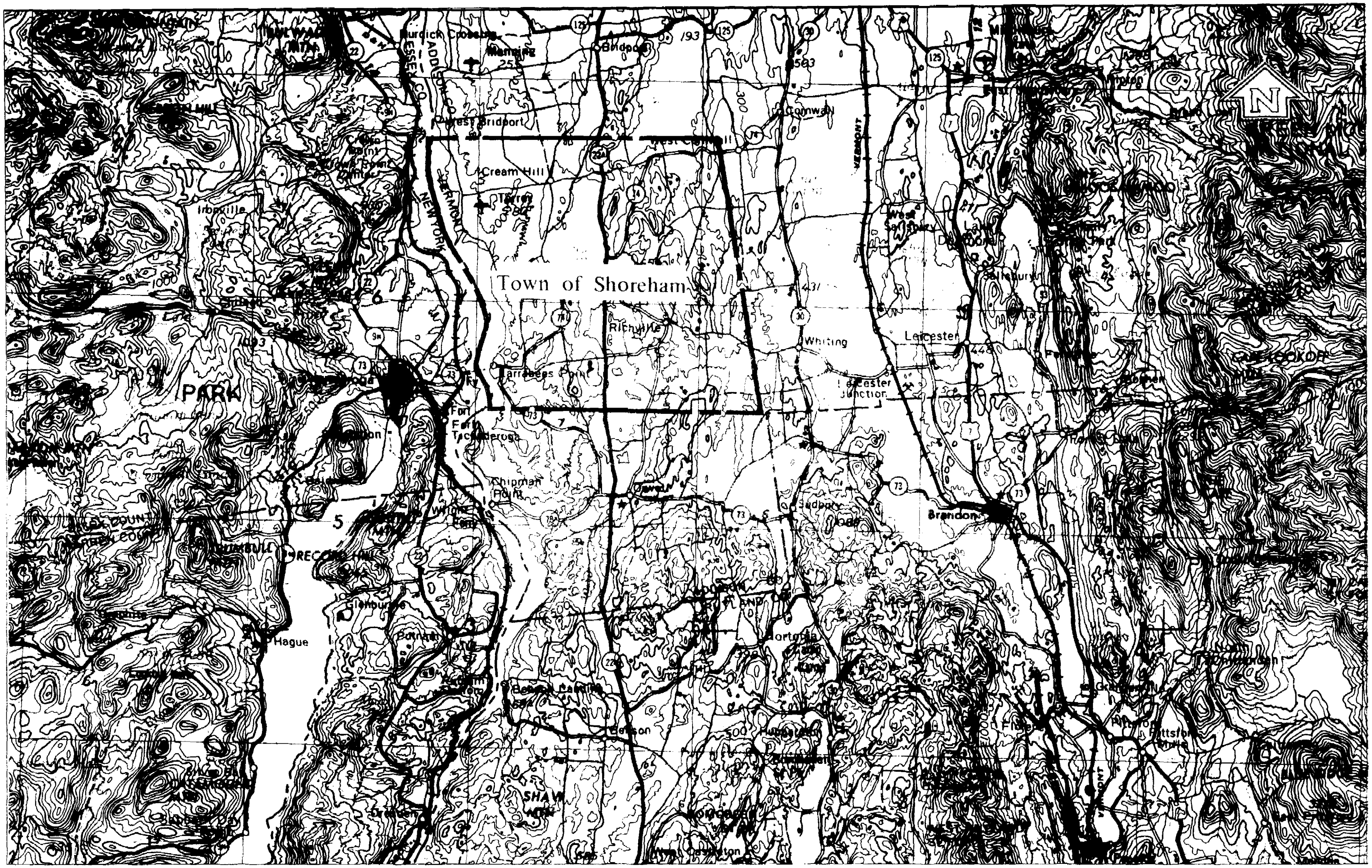
The areas studied by detailed methods were selected with priority given to all known flood hazard areas, areas of projected development and proposed construction until 1982.

Approximate methods of analysis were used to study those areas having low development potential and/or minimal flood hazards as identified at the initiation of the study. The scope and methods of study were proposed to and agreed upon by the Federal Insurance Administration and the community.

A detailed study was performed for Lake Champlain within the Town of Shoreham. Approximate studies were performed for Cedar Swamp, Prickly Ash Brook, Perry Brook, the Lemon Fair River, Bascom Brook, and Sawmill Brook.

2.2 Community Description

The Town of Shoreham is located in the western part of Addison County in west-central Vermont. It is bounded on the west by Lake Champlain and Essex County, New York; on the north by the Town of Bridport, Vermont; on the east by the Towns of Whiting and Cornwall, Vermont; and on the south by the Town of Orwell, Vermont. The 1975 population estimate of 900 represents a 14 percent increase over the 1970 census (Reference 1). The population of the town is fairly well distributed throughout, with a small concentration in the village area.



DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration	
TOWN OF SHOREHAM, VT **(ADDISON CO.)**	**VICINITY MAP**

FIGURE 1

The climate of this region is influenced by Lake Champlain and adjacent barriers, the Green Mountains and the Adirondacks. Lake Champlain has a significant moderating effect on the climate, extending the growing season to as much as 150 days at lakeside. Because the weather patterns are affected by the Green Mountians and the Adirondacks, along with some influence from the Taconic Mountains to the south, this valley is protected from most northeasters and tropical storms. The prevailing surface winds are generally from the south with frequent shifts to the north during the winter. Winter snows are light, averaging 60 to 70 inches annually. The average annual precipitation is also light, being only 33 inches. The average annual temperature is 46.3 degrees Fahrenheit (F.) comprised of five months, May through September, when the monthly mean is greater than 55 degrees F. and a portion of the winter, December through February, when the monthly means are less t' · 25 degrees F. (Reference 2).

Topography within the town is fairly uniform with gently rolling hills. The high point in Shoreham is the Pinnacle at an elevation of 659 feet. The region is underlain by either sandstone and quartzite of Cambrian age or by shale, slate, and limestone of Ordovician age. The hills on the easterly side in Shoreham are primarily silt and clay deposits resulting from post-glacial Lake Vermont.

The drainage pattern in the town is dendritic. The principal waterways are the Lemon Fair River, Bascom Brook, Perry Brook, Sawmill Brook, Cedar Swamp, Prickly Ash Brook, Richville Pond, and Lake Champlain. The Lemon Fair River and the other creeks and brooks have their headwaters in the low-lying hills of Shoreham and other immediately surrounding towns. The streams flow to the north and eventually drain into Lake Champlain, which is the sixth largest body of fresh water in the United States. The lake has a surface area of 490 square miles and is over 100 miles long, measured from the northern end at Rouses Point where it enters the Richilieu River to the southern end near Lock 12C of the New York State Barge Canal System.

Addison County has some of the best agricultural land in the State of Vermont and agriculture is the most important enterprise in the Town of Shoreham. A large portion of the cropland is being used to grow corn and hay in support of dairy farming, with several apple orchards growing close to Lake Champlain (Reference 3). Very little development has taken place in the flood plains at Shoreham, as the soils are generally not suited for construction and are even difficult to till for agricultural purposes. The area which is sustaining the greatest amount of damage associated with flooding is the shore of Lake Champlain where substantial amounts of erosion are taking place and a few seasonal dwellings of recent construction have been flooded.

2.3 Principal Flood Problems

Flood damage in the Town of Shoreham has been caused primarily by high levels of Lake Champlain and the consequent erosion of the bank materials

along the shore. The high lake levels have caused the flooding of some recreational properties near or on Lapham Island during the extreme high lake stages recorded in April and May of 1971, 1972, and 1976. The 1976 flood had an estimated 25-year return period. The rise in lake level is often associated with sudden snowmelt in the mountains which result in an enormous volume of water released from the mountainous, large (8,277 square mile) drainage area of Lake Champlain. Figures 2 and 3 show flood elevations and erosion potential in the area.

There are no reported instances of residential flooding along the other creeks, brooks, and rivers in the Town of Shoreham.

2.4 Flood Protection Measures

There are no flood control structures existing or authorized in the Town of Shoreham at the time of this study.

3.0 ENGINEERING METHODS

For flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Floods having recurrence intervals of 10-, 50-, 100-, and 500-years have been selected as having special significance for flood plain management and for flood insurance premium rates. The analyses reported here reflect current conditions in the watersheds of the streams.

3.1 Hydrologic and Hydraulic Analyses

Analyses were carried out to establish the peak stage-frequency relationships for floods of the selected recurrence intervals for Lake Champlain.

Analyses of the levels of Lake Champlain at the Bridport-Shoreham town boundary were based on an extension of the statistical analysis of the annual peak stages recorded at Rouses Point, New York, USGS gage #04295000, as evaluated by the U.S. Army Corps of Engineers (COE) using a log-Pearson Type III analysis (References 4 and 5). In the COE analysis, the flood levels from the period of continuous record, 1938-1976, were used. Peak stages as recorded at the USGS crest-stage gage located at the Fort Ticonderoga Railroad Station for the years of 1969 through 1976 were used in addition to the observations of local residents to transfer the statistical analysis for Rouses Point to the Fort Ticonderoga gaging site. These data were then adjusted for the slope from that site to the Lake Champlain Toll Bridge at Chimney Point by using an average value of the stage at Rouses Point and Fort Ticonderoga. This was necessary to adjust for the gradient on Lake Champlain, and was approved in a special problem report (Reference 6). The stage frequency table for Lake Champlain at the Bridport-Shoreham, Vermont town boundary is shown in Table 1, below.

FIGURE 2. Erosion Potential of Lake Champlain.

FIGURE 3. Flood Elevations at Lapham Island Access Road.

TABLE 1: STAGE FREQUENCY DATA
(without wave or run up heights)

Frequency Interval	Elevation (Feet NGVD)
10-year	101.43
50-year	102.27
100-year	102.53
500-year	102.99

The ultimate water levels on Lake Champlain can be raised by adding the dynamic effect of wind generated waves and run up. For purposes of providing information necessary to permit the assessment of flood hazards and flood plain management, the Federal Insurance Administration concurs with the water levels determined by hydrologic methods (without wave run up).

For the approximate study areas, no detailed hydraulic studies were performed because of the lack of current or planned development along these streams. Approximate elevations of the 100-year flood on streams not studied by detailed methods were determined by a combination of limited field reconnaissance and a regional stage-frequency relationship developed for streams in Vermont (Reference 7). Flooding along Sawmill Brook has not been shown due to a flood plain width less than 200 feet.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

A prime purpose of the National Flood Insurance Program is to encourage state and local governments to adopt sound flood plain management programs. Each Flood Insurance Study, therefore, includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the Federal Insurance Administration as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For Lake Champlain, which was studied in detail, the boundaries of the 100-year and 500-year floods have been delineated on the Flood Insurance Rate Map using the flood elevations determined by hydrologic analysis. The boundaries were interpolated using topographic maps photoenlarged to a scale of 1:9600, with a contour interval of 20 feet (Reference 8). Boundaries of the approximate study streams were delineated using the same topographic maps. Because of minimal flooding, portions of the Lemon Fair River and Sawmill River were not delineated as flood hazards.

Flood boundaries are indicated on the Flood Insurance Rate Map (Panels 0001-0020). On this map, the 100-year flood boundary corresponds to the boundary of the areas of special flood hazards (Zone A2), and the 500-year flood boundary corresponds to the boundary of areas of moderate flood hazards (Zone B). Small areas within the flood boundaries may lie above the

flood elevations and, therefore, not be subject to flooding; owing to lack of detailed topographical information or to limitations of the map scale, such areas are not shown. In cases where the 100-year and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

Certain areas shown on the Flood Hazard Boundary Map (Reference 9) were determined to be areas of minimal flooding and, as such, have not been included on the Flood Boundary Map and the Flood Insurance Rate Map.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the Federal Insurance Administration has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source affecting the Town of Shoreham.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses or waterbodies having relatively the same flood hazard. In lacustrine areas, reaches are limited to the distance for which the 100-year flood elevation does not vary more than 1.0 foot. Using these criteria, one reach was required for Lake Champlain in Shoreham. The location of this reach is shown on the Flood Insurance Rate Map.

5.2 Flood Hazard Factors

The Flood Hazard Factor is the Federal Insurance Administration device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their Flood Hazard Factors are used to set actuarial insurance premium rate tables based on Flood Hazard Factors from 005 to 200.

The Flood Hazard Factor for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the Flood Hazard Factor is 005; if the difference is 1.4 feet, the Flood Hazard Factor is 015; if the difference is 5.0 feet, the Flood Hazard Factor is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the Flood Hazard Factor is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective Flood Hazard Factors, the entire area of the Town of Shoreham was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or Flood Hazard Factors determined.
Zone A2:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to Flood Hazard Factor.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; or areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 2, "Flood Insurance Zone Data," summarizes the flood elevation differences, Flood Hazard Factors, flood insurance zones, and base flood elevations for the flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Town of Shoreham is, for insurance purposes, the principal result of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the Federal Insurance Administration.

6.0 OTHER STUDIES

In 1976, the Federal Insurance Administration published a Flood Insurance Study for the City of Plattsburgh, Clinton County, New York, in which flood elevations were established for Lake Champlain (Reference 10). The elevations established for the City of Plattsburgh were found to be inappropriate for the southern end of Lake Champlain through the analysis of short-term crest-stage gages (Reference 11) and the long period of daily observations by the New York State Department of

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3]
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
LAKE CHAMPLAIN REACH 1	0005,0015	−1.1	−0.3	0.5	010	A2	103 (NGVD)

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT

TABLE 2

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF SHOREHAM, VT
(ADDISON CO.)

FLOOD INSURANCE ZONE DATA

LAKE CHAMPLAIN

Transportation, Waterways Maintenance Group (Reference 12). There are ongoing studies of Lake Champlain for flood control purposes by the International Joint Commission. Since the completion of several studies for the International Joint Commission, a decision will be made relating to structural measures that could be completed on the Richelieu River to regulate Lake Champlain water levels (Reference 13).

None of the above-mentioned studies have determined stage-frequency relationships in the Town of Shoreham. A Flood Insurance Study for the Town of Bridport, Vermont, is in progress and is in complete agreement with this study (Reference 14). The flood boundaries delineated for this study are not in complete agreement with the previously published Flood Hazard Boundary Map for Shoreham, Vermont (Reference 9). As more detailed analyses were used herein, the boundary differences are justified.

This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the National Flood Insurance Program.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic and other pertinent data used in this study can be obtained by contacting the office of the Federal Insurance Administration, Regional Director, 15 New Chardon Street, Boston, Massachusetts 02114.

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